

Environmental Product Declaration



THE INTERNATIONAL EPD® SYSTEM



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Strand woven bamboo

from

**HUNAN TAOHUAJIANG BAMBOO SCIENCE &
TECHNOLOGY CO., LTD**



Programme:

The International EPD® System, www.environdec.com

Programme operator:

EPD International AB

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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



1. General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR):

PCR – 2019:14 Construction products (EPD International), version 1.3.4

UNCPC Code –31450 (Plywood, veneer panels and similar laminated wood of bamboo)

PCR review was conducted by:

The Technical Committee of the International EPD® System. A full list of members available on www.environdec.com. The review panel may be contacted via info@environdec.com

Chair of the PCR review: No appointed chair

Life Cycle Assessment (LCA)

LCA accountability: Penny Pan, Intertek Building & Construction

Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ EPD verification by individual verifier

Third-party verifier: Dandan Li, Star Talers EnviroTech Ltd

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☒ No

[Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical

declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

2. Company information

Owner of the EPD:

HUNAN TAOHUAJIANG BAMBOO SCIENCE & TECHNOLOGY CO., LTD
Address: Development Zones, Taojiang County, Yiyang City, Hunan Province, China
Website: www.chinathj.cn [chinathj.cn]
Contact: Cathy Ouyang
Email: cathy@chinathj.com
Tel: +86 15526401556

Description of the organisation:

HUNAN TAOHUAJIANG BAMBOO SCIENCE & TECHNOLOGY CO., LTD (hereafter referred to as THJ) was established in July 2001, located in Hunan, Taojiang Economic Development Zone. It has been concentrating on the research, development and manufacture of advanced Eco-friendly bamboo products for 23 years. And it is the first national high-tech enterprise in Hunan bamboo industry and a New OTC innovative enterprise.

THJ has obtained a number of national patents, scientific and technological achievements in the field of bamboo processing, with 29 domestic patents, 10 foreign patents and 7 international patents under PCT protection. The bamboo recombination and outdoor bamboo anti-corrosive bamboo production technique which invented by THJ Bamboo is significant scientific achievements in substantially improving the utilization rate of bamboo, increasing the additional value of products, and improving mechanization.

Product-related or management system-related certifications:

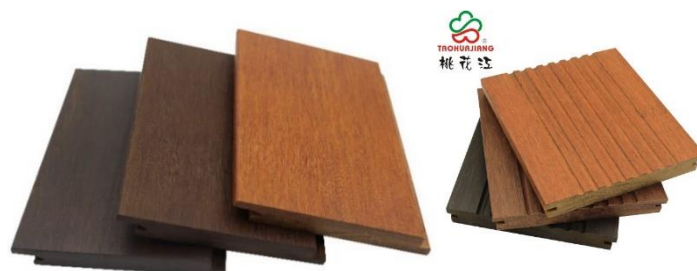
THJ has got the authentication of ISO9001:2008, ISO14001:2004, ASTM and REACH test report.

Name and location of production site(s):

Taojiang County, Yiyang City, Hunan Province (China).

3. Product information

Product name: Strand woven bamboo



Product description:

THJ strand woven bamboo is made from compressed bamboo fibers and carbonized under high temperature. A unique patented technology of high carbon anti-corrosion provides THJ strand woven bamboo with very durable class to be compliant with the EU safety standards and the compression promotes the stability and hardness. At the same time, it has the characteristics of environmental protection and beauty, anti-corrosion, fireproof and anti-slip, no deformation and no cracking, etc. THJ strand woven bamboo can be connected with an unlimited number of boards lengthways and this can only be done with very stable materials. It is suitable for outdoor application, even under rather tough condition.

UN CPC code: 31450 (Plywood, veneer panels and similar laminated wood of bamboo)

Geographical scope: Global

Product identification:

Table 1 Product technical properties

No.	Property	Test Method	Test results
1	Fire Resistance Class	EN13501-1:2018	Bfl-s1
2	UV exposure	ISO 4892-3:2016	grade4
3	Hardness	EN1534-2010	15Kgf/mm ²
4	Density	GB/T 30364-2013	1.12-1.15g/cm ³
5	Moisture Rate	GB/T 30364-2013	6-15%
6	Thickness of Swelling Rate	GB/T 30364-2013	≤1%
7	Width of Swelling Rate	GB/T 30364-2013	≤0.1%
8	Swelling in thickness After Immersion in Water	EN317:1993	0.002
9	Flexural Modulus	EN ISO 178:2010/Amd.1 :2013 Method A	12900Mpa
10	Light Ageing Test-UV Exposure	ISO 4892-3:2016 Cycle 1 & ISO 105-A02:1993/ Cor.2 :2005	grey scale3-4
11	Slip Resistance	CEN/TS 15676: 2007	SRV “dry” =74
12	Durability Test	EN 350:2016	class 1 (very durable)
13	Formaldehyde Release	EN717-1:2004	0.001mg/m ³
14	Resistance to Indentation	EN1534	9.5kg/mm ²
15	Lifetime	(EN ISO 178-2019)	25Years

Manufacturing process:

The main production process includes carbonizing the bamboo fibers to remove sugar and organic matter to achieve the effect of mildew prevention. After carbonization, bamboo fibers are glued with water-based phenolic resin followed by drying, balancing, cutting, surface treatment and packaging.

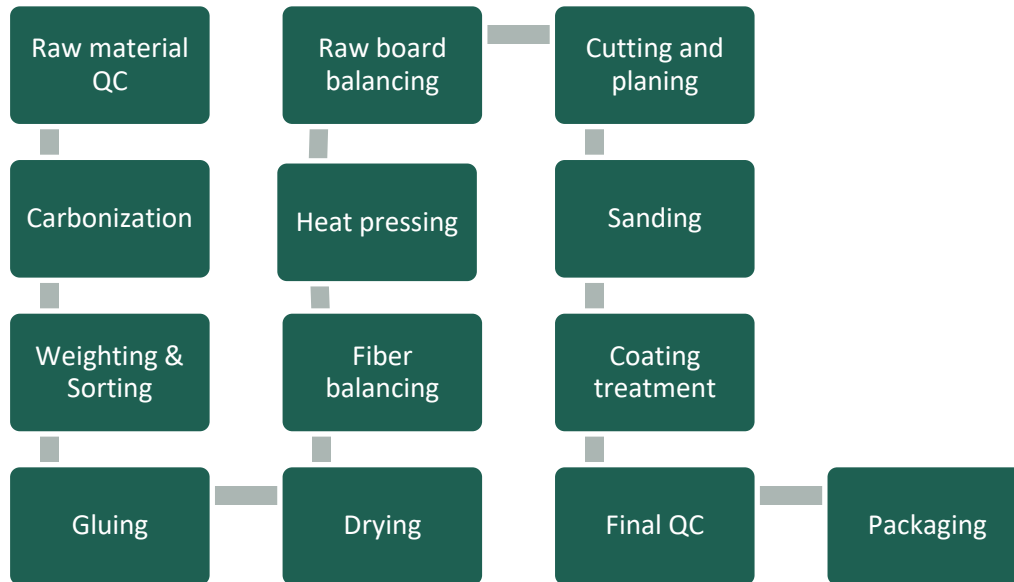


Figure 1: Manufacturing process of Strand woven bamboo

4. LCA information

Declared unit: 1 kg of strand woven bamboo products.

Time representativeness: 1st January 2023 to 31st December 2023(12 months)

Database(s) and LCA software used: SimaPro 9.6.0, Ecoinvent 3.9.1

Description of system boundaries:

Cradle to gate with options, modules C1–C4, module D and with optional modules (A1–A3 + C + D and A4-A5)

System diagram:

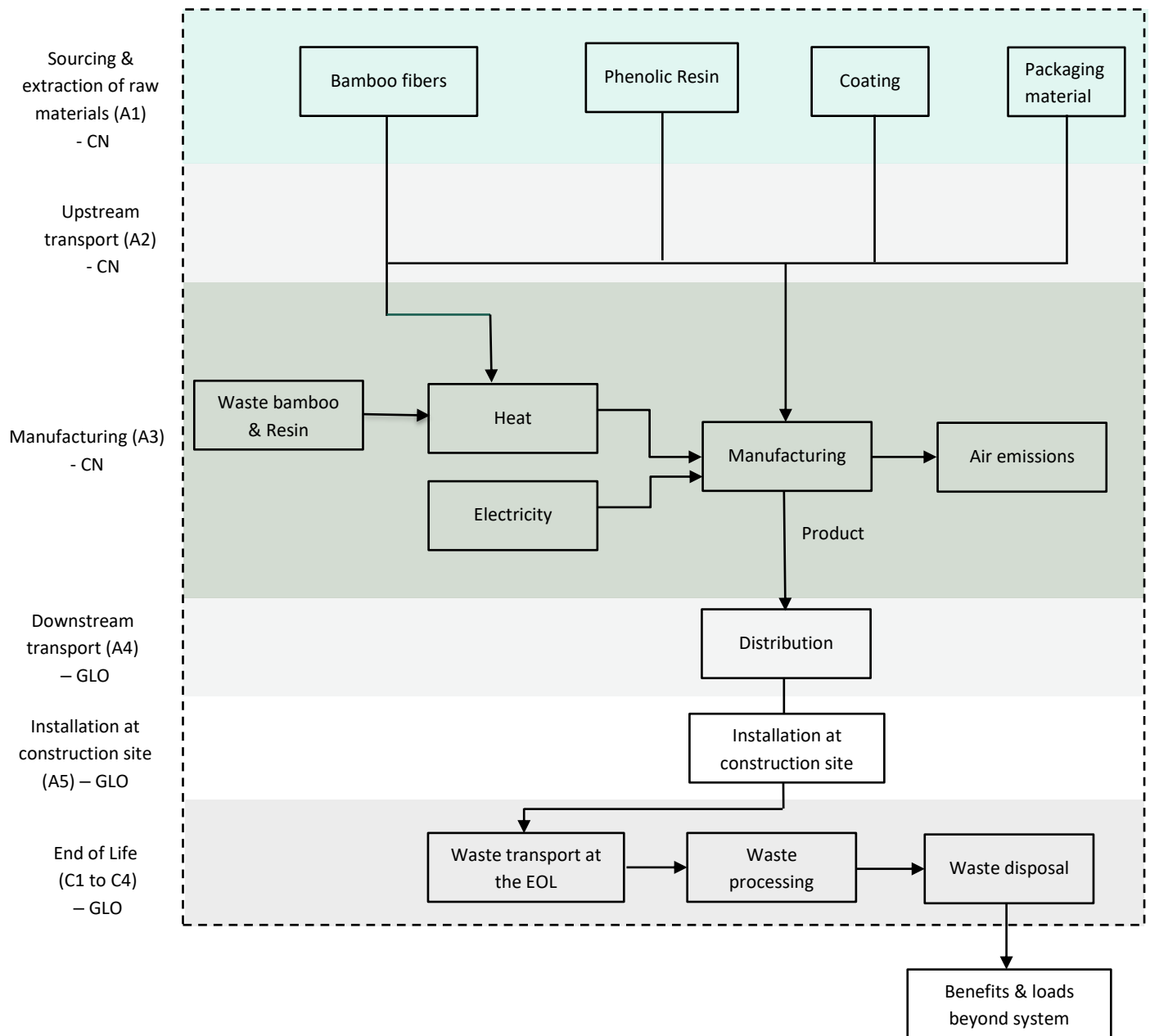


Figure 2: System boundary description for strand woven bamboo

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	CN	CN	CN	GLO	GLO	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Product stage (A1-A3):

Module A1 – The raw material and supply stage covers production and processing of raw materials and package material to bamboo products, and generation of electricity. The major materials include bamboo fibers, phenolic resin and outdoor coating. The company purchases all ingredients from China.

Module A2 - All raw materials including package materials are transported to the plant. The transport distances and routes were calculated based on information provided by the manufacturer for 2023.

Module A3 - The production process starts at the drying and carbonization with bamboo fibers, then connected with phenolic resin followed by surface finishing processes and packaging.

Construction process stage (A4-A5):

Module A4 – The target markets of strand woven bamboo include EU, Asia, America and Australia. Based on THJ's declaration, 45% bamboo products were distributed to EU, 45% bamboo products to Vietnam at Asia, 5% to Australia and 5% to American. Ship transport routes from China to overseas were calculated by map, and it is assumed that the products will be transported in a lorry to distributor located at 500 km distance from port.

Table 2 Transport to building site

Scenario information	Value		Units (expressed per declared unit)
	Lorry	Ship	
Fuel type and consumption	Diesel, 31.11	Heavy oil, 12.48	L/100km or t/100km
Distance	CN: 100 EU: 500 Asia: 500 America: 500 Australia: 500	EU: 20,000 Asia: 3,000 America: 20,000 Australia: 10,000	km
Capacity utilisation (including empty returns)	80	80	%
Bulk density of transportation	1,200	1,200	kg/m ³
Volume capacity utilisation factor	<1	<1	Not applicable

Module A5 – The product is designed for installation on a ground, thus the products are connected together by clips, no glue is needed for the installation. Electrical saw is considered for the product cutting and electrical screwdriver for fastening. It is assumed that no mass loss at installation, 50% packaging materials goes to recycling, the rest goes to incineration.

Table 3 – Installation of the product in the building

Scenario information	Value	Units (expressed per declared unit)
Ancillary materials for installation (specified by material)	SUS screw & clip: 0.006	kg
Water use	-	m ³
Other resource use	-	kg
Quantitative description of energy type (regional mix) and consumption during the installation process	0.0503	kWh
Waste materials on the building site before waste processing, generated by the product's installation (specified by type)	-	kg
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	PE film: 0.00012 PET belt: 0.00009 Corrugated box: 0.00012 Pallet: 0.00039	kg

Direct emissions to ambient air, soil and water	-	kg
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End of Life Module (C1-C4 & D):

Module C1 - Demounting and demolition are assumed to be conducted with electrical saw and electrical screwdriver.

Module C2 - It is assumed that waste products will be transported in a lorry to the waste processing/ disposal site located at 100 km distance (C2).

Module C3&C4 - In this analysis, it is assumed that 45% wasted bamboo products are incinerated to generate heat and electricity and 55% of the waste bamboo products are sent for landfill followed by Product Environmental Footprint (PEF) method.

As per PCR section 4.5.3, for waste that has not reached the end-of-waste state prior to its incineration, the thermal efficiency of the incineration process determines whether it shall be assigned to modules C3 or C4. If the thermal efficiency is higher than 60%, the incineration process is an energy recovery process and shall be assigned to C3. If the thermal efficiency is lower than 60%, the incineration process is a disposal process and shall be assigned to C4.

In this study, it is assumed that gross electric efficiency technology mix is 15.84% and gross thermal efficiency technology mix is 28.51% following by Ecoinvent 3 incineration data. Hence, 45% incineration and 55% landfill process shall be assigned to C4 stage in this study. As the waste contains biogenic carbon, it was adjusted manually by showing virtual biogenic CO₂ emissions as per PCR requirements.

Table 4 - End-of life

Process		Value	Units (expressed per declared unit)
Collection process specified type	Collected separately	1	kg
	Collected with mixed construction waste	-	kg
Recovery system specified by type	Reuse	-	kg
	Recycling	-	kg
	Energy recovery	-	kg
Disposal specified by type	Product or material for final deposition	1	kg
Assumption for scenario development, e.g. transportation	See description above		

Module D - It is assumed that some heat and electricity which benefited from incineration at C4 stage are accounted in Module D, and the recycling of 50% package material will contribute the benefit and credit at Module D.

Data Sources

Material production and transportation data used in the LCA modeling is provided by manufacturing site in China, supplemental datasets from an LCA database (Ecoinvent v3.9.1) were used where necessary.

Electricity source

this LCA study, the plant located at Hunan Province purchased electricity from the state grid central China branch. LCI data for the generation of electricity used in the manufacturing process is from ecoinvent v3.9.1 based on the year 2020.

In 2020, the source of power supply is 67.87% thermal power, 17.78% hydropower, 6.12% wind power, 4.80% nuclear and 3.42% solar. The applied electricity data set used in the manufacturing process is 0.915kg CO₂ eq./kWh.

Cut off rule

All the inflows are included and there is no cut-off used in this study, except for the biogenic carbon in the package material. The following general exclusions from the scope of the study were made:

- Human and animal energy inputs to processes.
- Production and disposal of infrastructure (machines, transport vehicles, roads, etc.) and their maintenance.
- Transport of employees to and from their normal place of work and business travel; and
- Environmental impacts associated with support functions (e.g., R&D, marketing, finance, management etc.).

Allocation

In terms of the specific data, all the data is specific to strand woven bamboo. Therefore, no allocation procedures were adopted.

In terms of generic data, the main database used, Ecoinvent v3.9.1 (cut-off), defaults to an economic allocation for most processes. However, in some cases a mass-based allocation is used, where there is a direct physical relationship (e.g., biomass related flows). The allocation approach of specific Ecoinvent modules is documented on their website and method reports (see www.Ecoinvent.org).

In the case of end-of-life allocation of generic data, the Ecoinvent v3.9.1 with a cut-off by classification end-of-life allocation method (100:0) was used.

5. Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Bamboo fibers	0.85	-	100%, 0.410kg C/kg
Phenolic resin	0.15	-	-
Coating	<0.001	-	-
Total	1	-	85%, 0.3485kg C/kg
Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Package film	1.20E-04	0.012%	-
Packing belt	9.00 E-05	0.009%	-
Corrugated board box	1.20E-04	0.012%	0.45kg C/kg -
Pallet	3.90E-04	0.039%	0.494kg C/kg -

Substances, REACH – Very High Concern:

The product does not contain any REACH SVHC substances in amounts greater than 0.1%(1000ppm)

6. Results of the environmental performance indicators

6.1 Mandatory impact category indicators according to EN 15804

Results per declared unit for 1 kg of strand woven bamboo									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	1.37E+00	2.35E-01	7.55E-02	3.66E-02	1.91E-02	0.00E+00	1.34E-02	-1.78E-03
GWP-biogenic	kg CO ₂ eq.	-1.20E+00	3.77E-05	1.70E-03	1.89E-04	1.12E-05	0.00E+00	1.28E+00	-4.59E-02
GWP-luluc	kg CO ₂ eq.	4.21E-03	1.51E-04	1.25E-04	7.74E-05	9.56E-06	0.00E+00	6.80E-06	-2.42E-06
GWP-total	kg CO ₂ eq.	1.66E-01	2.35E-01	7.73E-02	3.69E-02	1.91E-02	0.00E+00	1.29E+00	-4.76E-02
ODP	kg CFC 11 eq.	1.34E-08	3.82E-09	6.98E-10	2.58E-10	3.43E-10	0.00E+00	2.72E-10	-4.99E-10
AP	mol H ⁺ eq.	7.92E-03	3.98E-03	4.05E-04	1.91E-04	6.50E-05	0.00E+00	1.20E-04	-1.35E-05
EP-freshwater	kg P eq.	3.58E-04	1.28E-05	3.24E-05	1.75E-05	1.45E-06	0.00E+00	4.36E-06	-3.87E-06
EP-marine	kg N eq.	1.71E-03	1.03E-03	7.76E-05	3.61E-05	2.18E-05	0.00E+00	2.46E-04	-6.81E-06
EP-terrestrial	mol N eq.	1.88E-02	1.13E-02	7.82E-04	3.65E-04	2.31E-04	0.00E+00	5.58E-04	-5.80E-05
POCP	kg NMVOC eq.	7.03E-03	3.23E-03	2.49E-04	1.08E-04	9.16E-05	0.00E+00	1.70E-04	-1.55E-05
ADP-fossil*	MJ	2.27E+01	3.09E+00	9.34E-01	4.75E-01	2.69E-01	0.00E+00	2.00E-01	-1.46E-02
ADP-minerals & metals*	kg Sb eq.	1.86E-05	4.83E-07	1.01E-06	2.05E-07	6.10E-08	0.00E+00	2.55E-08	-3.61E-09
WDP*	m ³	4.71E-01	1.03E-02	1.36E-02	6.42E-03	1.15E-03	0.00E+00	6.82E-04	-1.35E-04
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals & metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

Disclaimer:

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Module C is included in this EPD, and care shall be taken to avoid using of the results of modules A1-A3 without considering the results of module C.

*The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.

EN 15804 reference package was based on EF 3.1 version published in July 2022.

6.2 Additional mandatory and voluntary impact category indicators

Results per declared unit for 1 kg of strand woven bamboo									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG ¹	kg CO ₂ eq.	1.41E+00	2.35E-01	7.63E-02	3.68E-02	1.91E-02	0.00E+00	4.78E-02	-1.79E-03
Particulate matter	disease inc.	1.88E-07	1.26E-08	4.64E-09	1.61E-09	1.51E-09	0.00E+00	1.80E-09	-1.46E-10
Ionizing radiation ²	kBq U-235 eq	4.54E-02	2.38E-03	8.95E-03	5.24E-03	2.87E-04	0.00E+00	2.66E-04	-2.50E-05
Ecotoxicity, freshwater ³	CTUe	1.50E+01	1.59E+00	2.86E-01	1.07E-01	1.42E-01	0.00E+00	1.40E-01	-1.95E-02
Human toxicity, non-cancer ³	CTUh	3.59E-08	1.58E-09	1.30E-09	4.68E-10	1.91E-10	0.00E+00	1.00E-09	-1.33E-10
Human toxicity, cancer ³	CTUh	6.44E-09	1.04E-10	2.15E-10	1.10E-11	8.63E-12	0.00E+00	2.26E-11	-4.96E-12
Land use ³	Pt	3.65E+01	1.07E+00	3.00E-01	8.26E-02	1.60E-01	0.00E+00	3.36E-01	-5.40E-02

Disclaimer 1 – This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO₂ is set to zero.

Disclaimer 2 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 3 - The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

6.3 Resource use indicators

Results per declared unit for 1 kg of strand woven bamboo									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	7.32E+00	3.28E-02	1.70E-01	6.60E-02	3.76E-03	0.00E+00	1.50E+01	-6.66E-03
PERM	MJ	1.50E+01	0.00E+00	-6.72E-03	0.00E+00	0.00E+00	0.00E+00	-1.50E+01	0.00E+00
PERT	MJ	2.24E+01	3.28E-02	1.63E-01	6.60E-02	3.76E-03	0.00E+00	4.07E-03	-6.66E-03
PENRE	MJ	1.76E+01	3.09E+00	9.41E-01	4.75E-01	2.69E-01	0.00E+00	5.24E+00	-1.46E-02
PENRM	MJ	5.04E+00	0.00E+00	-7.16E-03	0.00E+00	0.00E+00	0.00E+00	-5.04E+00	0.00E+00
PENRT	MJ	2.27E+01	3.09E+00	9.34E-01	4.75E-01	2.69E-01	0.00E+00	2.00E-01	-1.46E-02
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	2.87E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	1.20E-02	3.46E-04	5.67E-04	2.63E-04	3.79E-05	0.00E+00	4.58E-05	-9.09E-06
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

6.4 Waste indicators

Results per declared unit for 1 kg of strand woven bamboo									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.40E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	9.20E-02	0.00E+00	3.60E-04	0.00E+00	0.00E+00	0.00E+00	1.00E+00	0.00E+00
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

6.5 Output flow indicators

Results per declared unit for 1 kg of strand woven bamboo									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	3.60E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	6.26E-04	0.00E+00	0.00E+00	0.00E+00	7.83E-01	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	1.26E-03	0.00E+00	0.00E+00	0.00E+00	1.57E+00	0.00E+00

References

- Ecoinvent (2022). Ecoinvent v3.9 Swiss Centre for Life Cycle Inventories. Available from www.Ecoinvent.ch
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